HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: UK telecommunications infrastructure and the UK's domestic capability, HC 450

Wednesday 22 July 2020

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Watch the meeting

Members present: Greg Clark (Chair); Aaron Bell; Dawn Butler; Katherine Fletcher; Mark Logan.

Questions 207 - 314

Witnesses

I: Amy Karam, Fellow, Canadian Global Affairs Institute, and Global Strategist; and Dr Dritan Kaleshi, Head of Technology (5G), Digital Catapult.

II: The right hon. Oliver Dowden MP, Secretary of State for Digital, Culture, Media and Sport.

Examination of witnesses

Witnesses: Amy Karam and Dr Kaleshi.

Q207 **Chair:** The Science and Technology Committee is continuing its inquiry into the UK's telecommunications infrastructure and its domestic capability, with particular reference to 5G. I am delighted that we have two panels this afternoon. The first consists of two telecommunications policy experts, and then we have the Secretary of State for Digital, Culture, Media and Sport.

Without further ado, let me welcome our first two witnesses. Amy Karam is a fellow of the Canadian Global Affairs Institute and Dr Dritan Kaleshi is head of technology for 5G at the Digital Catapult here in the UK. Thank you very much indeed. We have a lot of ground to cover, so I would particularly appreciate it if you could keep answers short so that we can get through lots of material.

Perhaps I can start with some questions to Amy Karam. Drawing on the Canadian perspective, what impact has the recent US sanctions regime had on the prospective roll-out of 5G in Canada?

Amy Karam: Given the recent geopolitical dynamics, it has delayed the roll-out.

Q208 **Chair:** By how long would you say?

Amy Karam: It depends on what is next in terms of the strategy. The Five Eyes have definitely moved in a particular direction, so we are waiting for the Canadian Government to make their decision on which direction. Short term, it could be one to two years; depending on how drastic the changes are, it could be two to three years, in my humble opinion.

Q209 **Chair:** For the benefit of members of the Committee and viewers of our proceedings here in the UK, would you describe who are the current participants in the Canadian market and at what stage the Government are in their consideration of the future?

Amy Karam: Do you mean who are the operators playing in the telecom market?

Q210 **Chair:** And the vendors in particular.

Amy Karam: The vendors currently in play are Ericsson and Nokia; Samsung is beginning to enter, given a slight pause, and there is some Huawei in the existing networks on the 4G side. The primary telecom players are Bell, TELUS and Rogers.

Q211 **Chair:** What has the Canadian Government's policy demeanour been with respect to the future of 5G?

Amy Karam: We are waiting to hear what the policy will be in the future; it is on pause at the moment. That is why some of the operators have made their own decisions on vendors going forward.

Q212 **Chair:** Have there been no restrictions to date on Huawei, for example, in its participation in the Canadian market?

Amy Karam: The participation of Huawei thus far has been in the RAN, on the edge side.

Q213 **Chair:** Have policy constraints been placed on a maximum level of participation?

Amy Karam: Yes.

Q214 **Chair:** What have they been?

Amy Karam: I don't know that there is a maximum participation in the RAN, but they are not allowed in the core.

Q215 **Chair:** I see. That is the restriction. Is that now under review in light of US sanctions or separate from those? Was the review occasioned by the US sanctions?

Amy Karam: I think it has been an ongoing policy creation in parallel. I do not know that there has been a distinct move, given the US sanctions, due to the geopolitical concerns as well.

Q216 **Chair:** From your perspective, what do you see as the principal trade-offs? Do you think there is a trade-off between security and the economic possibilities coming sooner, if I can put it that way? Is that the essence of the policy debate that needs to be settled?

Amy Karam: There is definitely an economic component to a lot of the decision making. Before the sanctions were amplified, there was definitely an economic benefit in choosing Huawei. They are a formidable competitor among vendors; they offer great service to their customers; they go above and beyond with added support, and they customise and so on. They have the competitive advantage of not being a public company. Other public vendors like Nokia and Ericsson are beholden to shareholders, so the economic benefit for purchasers of Huawei equipment is that they get more for their money; they get more for that investment.

On the economic front, in terms of the broader Canadian economy there have definitely been some broader benefits: the investments Huawei has made in job creation and locating their research and development here. They have stepped up to help with the rural expansion of telecom broadband reach. There have definitely been some economic pluses from having Huawei in Canada, as for other nations as well.

Q217 **Dawn Butler:** I have a few questions about infrastructure and your views on how you see us coping with that in the UK. We are very much catching up with what needs to be done. The UK's short-term strategy is

to mitigate the effects of banning Huawei, and consider what it will look like in terms of how we strip out the current Huawei infrastructure and so on. We are trying in the UK to secure other incumbent equipment vendors, such as Nokia and Ericsson, while trying to attract large companies. To what extent do you think that is an appropriate approach?

Amy Karam: Appropriate in what context?

Q218 **Dawn Butler:** Do you think it is a good way forward? I think you are a little bit ahead of us in your thinking, so I wonder whether you think the UK's approach in the short term is a good way forward.

Amy Karam: Thank you for that compliment. I am not sure, but let me try. In light of the political environment and the uncertainty of sustainability going forward with Huawei equipment, given the US sanctions, it is probably the right way to go at the moment to look to diversify some of your vendors.

It is not just the UK that is in this position; Canada is in the same position. The US has a different status, and I will get to that in a moment. The challenge was not having a lot of foresight or a longer-term view from a lot of our economies. We did not diversify enough up front, and, even worse from a global competitiveness perspective, many of us took our eye off the ball and lost sight of the 5G telecom opportunity. That is especially unfortunate given the fact that Canada had Nortel, which had been a leading telecom provider for over 100 years. The UK had Marconi and STC for a while, and then they were bought or went away.

It is a good catch-up strategy in the interim to mitigate a lot of the supply chain risk that has been identified, as well as mitigating some of the geopolitical risk that is currently incumbent on us. If your question is about whether that is the right thing to do now, yes.

Q219 **Dawn Butler:** Dr Kaleshi, what is your view?

Dr Kaleshi: If we are looking at it as an immediate strategy, the situation is pretty much as Amy described it. In addition to what Amy said, I highlight what is happening in the technology industry itself, within the mobile industry. The virtualisation and softwarisation of the industry is creating a big shift and an opportunity that can be used effectively to address the systemic underfunding we have seen for the past 15 years. As Amy put it very correctly, it is not just the UK; it is seen more broadly.

As the Committee has already heard in previous sessions, the vendor supply chain in the past 20 years has been reduced dramatically both in the UK and in other parts of the western world that have been associated, certainly in the past 15 years, with refocusing and underfunding certain elements of the supply chain of the R&D necessary to address very long-term needs. Effectively, people invest today for 10 years in the future. That is precisely why for all of the geopolitical

reasons, but also for technological reasons, this is a good time to have a very in-depth look at the strategy and what needs to be done immediately in order for the outcome to be achieved, both in the medium and long term.

Q220 **Dawn Butler:** How do we catch up? What does it take for us to catch up? What sort of investment are we looking at? What do we need to do? Can all the westernised countries work together?

Dr Kaleshi: It is a key question, but all of it will depend on the ambition and strategic objective of the particular long-term view for the country. One of the typical misconceptions embedded in the past has been that infrastructure, in particular telecoms infrastructure, can be developed largely independently of the rest of the digital revolution that we are going through. There is a very close interplay of 5G with softwarisation; it exposes almost two tectonic plates moving against each another—the IT world with softwarisation and the telecoms world—and 5G is exposing a particular opportunity to change the way we approach the digital infrastructure in the UK and the western world.

To go back to the goal of that particular strategy, which is the diversification of supply, as you have heard in previous sessions, and as I am sure you have been briefed, the position of the existing vendors has been solidified in the world, with significant sustained investment over decades, literally 20 years, so there will not be a short and easy answer to creating a new vendor that will be able to come in immediately. However, there are very specific pragmatic and practical steps that can be taken, together with the long-term strategy, to take advantage of the technological advances that are already happening.

Softwarisation and virtualisation, the move from specialised boxes to software that can run on general purpose computing, can immediately create a movement that in time will generate suppliers that will be able to fit into particular aspects. For example, there will be suppliers both in the UK and in the rest of the world that will be able to take advantage of those technological features and work very quickly, without needing the heavy investment that is required on the hardware side in particular and the optimisation of that hardware, which is very significant, in order to move potentially in the enterprise private network domain space, while the replacement strategy goes on to prepare for the medium to long-term maturation of the market. That is just an example and not the only one.

Q221 **Dawn Butler:** Amy, how do we catch up? Is there a way we can work together with Canada and the UK? You do a bit; we do a bit. What will that look like for you in the short, medium and long term?

Amy Karam: Excellent. I am so pleased that you are thinking that way about collaboration. To take a little step back, one of the first questions you were asking was why we are in this position. If you did not ask it specifically, I am going to pose it.

The reason we are experiencing this gap is that free markets, essentially, failed the US, Canada and the UK by creating the gap—free markets being capitalism. Creating radio access network equipment is not very lucrative. Why doesn't the US, the biggest superpower in the world, have this play? Because its network providers—Cisco was the giant over the last couple of decades—did not invest in the RAN; they were beholden to Wall Street, and shareholders and quarterly reporting, and they wanted to protect their 65% margin. I worked for Cisco for over a decade. I am not quoting inside information; it is my analysis and speculation on why we do not have a play. We all had that gap. Canada could have saved Nortel with a $2 billion to $4 billion bail-out, but the Government chose not to.

What does that all equate to? What do you do in the short term? We have to institute the sometimes less favoured term, industrial policy. We have let free markets or capitalism decide. They decided it was not lucrative, but that economic decision, that economic security, is now impacting our national security concerns.

We have to shift the mindset from free markets to how we help national security with economic security policies. Industrial policy has not been a very attractive term; maybe we should do industrial policy 2.0 in order to foster the closer Government-private sector relationship that is really necessary. Where China succeeded was in that tight coupling. The Chinese Government helped catapult Huawei to a global leader because they facilitated that growth.

I used to speak to the US Government when I lived there. I lived in Silicon Valley in the States for 15 years. I escalated the Cisco unfair trade practices to our Government, and they said, "We cannot play favourites." Instead of playing favourites, we need to figure out how we foster mass competitive advantage across a lot of vendors. That is one approach.

You asked what to do to catch up in the short and medium term. I think we take a leapfrog approach. I do not think we can create a RAN vendor at this point in time. As Dr Kaleshi has already mentioned, it takes decades of R&D and investment. The margins are so low that it is not attractive. That catch-up cannot happen, but what I think Dr Kaleshi was referring to was OpenRAN technology, so it becomes a commoditised play. There are a number of players that contribute to the solution—the parts. That is how you accelerate multiple players and have more vendors.

Perhaps as you co-operate with your allies, the US and Canada, you create centres of excellence around each of the components that create OpenRAN. You have to mandate that the solution be implemented by operators and vendors alike. For example, BT must have OpenRAN in, say, 50% of the radio access component of its network by 2021, or whatever the case may be. You quickly accelerate that migration. When

there is commercial opportunity, some of the smaller players will rally, but it is important for everybody to be on board.

For the allies to succeed in working together, they all have to agree. There is the common term "fear of missing out", or, if you want to be sophisticated about it, no country or operator wants to lose a competitive advantage, so we need to co-operate. It has been slowed down, so maybe we take a step back and say, "What is the rush really to 5G?" Technically speaking, 5G is just another highway but a faster one; it is the German autobahn as opposed to the current speed-limited highways in some other countries. I am not a car buff, so maybe that is a bad analogy. Today, 4G is working just fine. Can we all agree that our services and applications will continue to grow on that? Can we all agree that we will be delayed in rolling out 5G by a year or two and that this is the migration plan we are putting in place?

It is a little bit of a leapfrog approach. Instead of catching up with RAN, it is leapfrogging into O-RAN, and for O-RAN to succeed it has to be a strict collaborative with everybody in agreement.

Q222 **Chair:** On the point you made about an industrial strategy and policy looking ahead, what did it require? Dr Kaleshi made a point about research and development being underfunded. Was the implication, Dr Kaleshi, that it should have been publicly funded?

Dr Kaleshi: No. I meant that both public and private investment in R&D has been shrinking for the past 15 years in the telecom space, in the western world in particular, with the exception of the vendors. I did not mean that it was strictly on the public side; it is both private and public. Most of the funding that has gone in is on the private side.

If I may pick up a point Amy mentioned, there is already a lot of collaboration existing in the world. Like all the other telecom networks, 5G is a collaborative effort. We already have collaboration with the Montreal-Quebec 5G corridor project, a Can$400 million activity that started about 18 months after the 5G testbeds and trials programme in the UK. Those kinds of co-ordination were not driven by the geopolitical priorities as they are now; they were driven by the development, and in particular the meaningful and purposeful adoption, of the technology. That has already prepared us to move to a more collaborative approach in the development of the technology, but it will require rethinking and incentivisation in public and private funding.

Q223 **Chair:** In terms of the investment required, how do you account for the fact that Ericsson and Nokia are able to compete internationally?

Dr Kaleshi: That has already been touched on in previous sessions, but not in the direct way you are asking. The decrease in the number of vendors in the world has been driven particularly by share of the market. For those three or four vendors, with Samsung recently moving into the network domain, it has been particularly driven by the fact that they

needed to, and could, address penetration of specific sectors in the markets where they have particular strengths: Latin America, north America, Europe and Asia and Australia.

Q224 **Aaron Bell:** Ms Karam, you spoke about free market failure and about industrial strategy, which is back in vogue in more ways than just this area. Looking back before we look forward, to what extent was that failure incubated by China? Was it a geopolitical strategy by China, or would you characterise it as more an industrial strategy?

Amy Karam: I am not sure I understand the question. Are you asking why it worked for China, or whether China caused us to—

Q225 **Aaron Bell:** Essentially, did China undercut us deliberately over the period that has led to this situation?

Amy Karam: I don't believe so. They just had a very assertive policy. They had very big goals. They were very driven and they have fewer rules, or rules that we do not operate by. Our playbook, the western playbook, may constrain us in different ways.

Looking at it in another way, China's growth is because the Government decided, "We are going to grow globally. We are going to foster this growth and we are going to use different means than the west is used to to enable that." For example, when I was at Cisco I led a competitive intelligence and sales support programme for my sales teams worldwide on how to compete with Huawei. A lot of the escalations I would get at corporate headquarters were, "Oh, my goodness. Huawei won our $10 million bid in country X. It was a national infrastructure build-out. We were sure we had it. We had the RFP down; we had the technical details, but at the 11th hour the company decided to select Huawei."

That goes back over a decade; it was between 2005 and 2010, when Huawei had substandard products. Today, they are the leader in the market—thanks to academic research from UK and Canadian academics, as well as other places, but that is neither here nor there. The reason they succeeded in penetrating different markets globally is that their Government represented select companies, like Huawei, and included them as part of national trade agreements. They said, "Country X, we're going to help you with your socioeconomic development goals and we're going to help you do this and that." Their promises were large, so they would throw in, "And in return could you give Huawei that network infrastructure contract for $10 million?" I would hear that it was a mandate from above and beyond the company level.

My point is that China went out full and strong; they played on terms we do not play on. We do not play by those rules; America does not tell another country that it must purchase Cisco networking equipment if it wants to do a trade agreement with America. Those are the dynamics. They created their own system that was a competitive disadvantage for our system.

Q226 **Aaron Bell:** That is a very helpful illustrative example of what we are talking about. You have spoken very favourably about western collaboration so far. Should that collaboration in finding solutions for 5G be instigated by the security and information-sharing initiatives that we have, such as Five Eyes, and what are the advantages and disadvantages of having it as a security-led thing rather than a commercial approach?

Amy Karam: There is definitely value in having the security commissions participate, but if it can be a collaborative effort that would be fruitful. The security bodies have been very objective, and they have been good at identifying the true gaps, but to amplify and accelerate development it could be a dual-group initiative. That is not to discount what the security group does; I just think that in order to commercialise and create a position in the 5G market in a quick way there are many dynamics to consider.

Q227 **Aaron Bell:** Do you suggest that we need to go wider than just the Five Eyes countries and bring on board other countries, even though they do not necessarily share the same views on Huawei?

Amy Karam: Yes, absolutely. I am glad you asked that question. There is one other key thing we are forgetting. There are two phases. We—the Five Eyes—and some other countries are playing defence, even from an economic or competitive perspective. We are trying to play catch-up. We admit that we took our eye off the ball, and now we want to play because we know it is important not only for economic security but for national security.

However, if we want to be a significant player globally in the long term—in five, 10, 15 or 20 years—we should not forget about emerging markets. Emerging markets are a big potential market, so just from a commercial business perspective if we, collectively the Five Eyes, want to have a significant play in 5G, beyond just the national security concern, we need to recruit other countries. Huawei and China are viewed very favourably in a lot of emerging countries. If they are the future for addressable markets, we need to reach out and recruit more players.

Q228 **Aaron Bell:** The potential approaches for that collaborative solution obviously include things like common standards—we will talk a little more about OpenRAN later, if that is okay—collective purchasing and co-ordinated R&D funding. In what other ways could a western collaboration work?

Amy Karam: By tapping into the academics. We talked about research, development and funding. The UK, Canada and the US have pools of really intelligent people. There is a lot of intellectual capital we can tap into. One of the biggest bees in my bonnet is that we have researchers in 13 universities across Canada fuelling Huawei's 5G R&D, because they are smart, curious and want to apply themselves, and Huawei said, "Let us be the catalyst for that." That is yet another source for us to tap into. First, they understand the market, and, secondly, they understand

Huawei's solution. How can we mobilise that intellectual capital to work together and figure out the next solution?

Q229 **Aaron Bell:** Dr Kaleshi, on the point about R&D, what existing international R&D support can the UK currently call upon?

Dr Kaleshi: There are various existing schemes and collaborations through UKRI. The strongest existing and most easily accessible funding is Horizon 2020 and European collaboration. The second aspect is within the EPSRC. There are standing agreements and bilateral agreements with different countries in the world, including South Korea, China, the US and Canada for certain, and Brazil and other countries in the world, under various schemes managed by different Departments in the Government. The key words are "different Departments in the Government".

Q230 **Aaron Bell:** Ms Karam, is there a danger or possibility that we end up with two competing sets of standards in the world, a western set of standards and a Chinese set of standards, and what would be the implications of that?

Amy Karam: It is absolutely a possibility. I would say it is almost a likelihood. That's competition. We experience it in the other protocols in wireless technology. We had CDMA, TDMA and GSM. Market forces determine which one rises to the top and continues to grow, and we continue to build on it.

Q231 **Aaron Bell:** It sounds like it might be a bit more than just market forces if it is the west against China. Given the geopolitical implications of all the other things China is doing around the world, it is not just a question of the best product wins, is it?

Amy Karam: That is a really good point. Yes, of course China has been rallying its supporters and its customer base. In fact, I have heard that they may already be in 70 or 80 countries with 5G.

I would call this a co-opetition model. Once the tension dissipates, at least to some degree geopolitically, if we were to look into the future at how we all get along, we have to figure out how everybody plays in the same sandbox, which is 5G or wireless communications, exhibiting mutual respect. To clarify, "co-opetition" stands for "co-operative competition". There are multiple vendors, they all play and may the best choice win.

The OpenRAN solution says that, essentially, Huawei can play too. You can instil the idea that all vendors, Ericsson, Nokia and Huawei, must also provide an OpenRAN option instead of the SingleRAN solution. In that way, we just say, "Okay, Huawei. You beat us to the market, but we want to play too, so let the customer decide."

It is a leap in the thought process, but ultimately, when the west comes up, once we have our feet on the ground and have a comfort zone and are participating in the very important national and economic security

market, that equilibrium might be achieved. It could be a reach, but that would be an idyllic situation.

Aaron Bell: Thank you. I hope I will have time for some OpenRan questions later.

Q232 **Chair:** Absolutely. To pick up something Ms Karam said, if I have captured it correctly, we should not rush headlong into 5G. If it takes a couple of years' delay to develop our own standards, we can get along okay with 4G during that time. Is that a fair distillation of the point, Ms Karam?

Amy Karam: I am going to say yes, but please do not share it with my potential telecom clients.

Q233 **Chair:** It is just between us.

Amy Karam: But it will only work if everyone agrees to it. I would not recommend it if one operator says, "Okay, I'm going to delay," and then its competitors do not. That is hugely unfair. There has to be a collective agreement for it to be successful.

Q234 **Chair:** Dr Kaleshi's job is to advance 5G in this country. What do you think of the suggestion that we should take our time and not proceed at the pace we otherwise could?

Dr Kaleshi: It was a valid suggestion three years ago. If we look back at the analysis that was done in 2016 and 2017 in the UK, in particular the National Infrastructure Commission connected nations report and the work done by the Future Communications Challenges Group on positioning R&D and standardisation leadership in the UK on 5G, at that time that option was a worthy one to consider, but precisely for the reason Ms Karam gave, in my opinion the horse has bolted. In previous sessions you heard evidence from both Vodafone and BT—other operators in the UK will state the same position—that they made a very clear decision that they did not want to be in the same position as they were in 2012-13, when they delayed the roll-out of 4G in the UK. That was for very good reasons at the time, but certain operators in the UK felt they were put at a disadvantage in the market. That particular horse has bolted.

On the second part of the question, one of the things we all need to understand and remember is that 5G is not a snapshot; it is a continuing evolution of standards, with renewal of specifications and international standards at least three times in a decade before we go to the next one, and, hopefully, does not have this kind of cut-off. Because of that, to wait and jump is not possible; the technology, innovation and R&D cycles feed one other. From that perspective, waiting and holding back is probably not an option because it has already started, although the current situation, as you have already heard, will cause that particular delay anyway.

Q235 **Chair:** Ms Karam was agreeing with that, nodding vigorously when you were speaking.

Amy Karam: Yes. There appears to be an idea that it is a light switch, on or off—5G, yes: 5G, no. I agree with Dr Kaleshi that it has been happening and it is a gradual integration. As we sell it or promote it to customers, there is a life cycle before people understand what it can do and integrate it. There is a transition from their current applications and services to the extreme promise of 5G. There is a lot of infrastructure already in place today that operators can use. Maybe the interim is that we keep using Samsung, Nokia and Ericsson, but the original question was what we do in the medium term to catch up. Those are two different questions.

Commercially, to use an American term, we can keep on trucking; we can keep moving along that path, because a lot of the 5G solutions are overlays with 4G today. There is an interoperability in network configuration. I am not even going to pretend to be able to explain that to you. Some of the previous witnesses did a great job on that.

I agree. Let's keep moving in the immediate term, but if you are looking at how to catch up, there has to be in parallel a revectoring of the strategy, so that you move to OpenRAN, or whatever the collective agreement is on the software-based solution, and at a specified point in time you, the players—Five Eyes, plus whoever else you want to introduce—have the opportunity to be the alternative vendors, so that migration and evolution can continue in the medium to long term.

Q236 **Katherine Fletcher:** If we follow through what Ms Karam was saying, let's start to understand what the UK can do with its research and development capability to contribute. Dr Kaleshi, where are we in research and development? Where are our strengths? What can we offer the globe as part of this collaboration, be it 11 Eyes or whatever?

Dr Kaleshi: If we look across R&D, the UK has been a leader. It is a very well-known but often forgotten fact that GSM standardisation was largely led and catalysed by the direct involvement of the UK, including the UK Government. During the '80s, '90s and 2000s there was a very significant contribution from the UK, probably second to the US in the world, in telecoms and computer science research, to put it together in one—the ICT domain, although at the time it was not literally like that—and it was very visible.

When we did an analysis in 2018 in the "5G Nation" report, as a snapshot, it was very visible that academic work in the UK in the telecoms space was world-leading in various areas, including network softwarisation, orchestration, network slicing, multiple input, multiple output and some of the massive MIMO, increasing the efficiency of spectrum usage. All of those things are fundamental technological solutions going forward.

From 2005 to 2015, we established the 5G innovation centre at the University of Surrey, and we strengthened the University of Bristol's high-performance network research group and smart internet lab. There are nuclei of individual groups, not with quite the same critical mass but sufficient in terms of human capital to carry the early R&D work.

The second element of picking up the R&D work and shifting it into pick-up by industry needs to be looked at in the context I mentioned earlier of the retreat in industrial R&D in telecoms in the UK in the past decade or 15 years, maybe reaching back to 2002. That is the point where you see absorption of the academic output into fundamentally industrial standards. To go back to the Chair's comment on why Nokia and Ericsson were able to put in private funding, that has been associated with the concentration of funding because that is the only way you will effectively go into the market. It then becomes very hard for medium and small players to pick up innovation aspects from either the universities or the R&D they do themselves and scale it up.

That is particularly the place where, in the UK landscape, technology organisations like the Digital Catapult are focusing. How do we take the R&D work and the capabilities of human capital and, with the 5G testbeds and trials programme, restart industrial R&D in the UK to re-engage with, mostly, private funding to create a co-ordinated landscape that can pull us through the short-term part on the way to the medium and long-term part?

The capabilities are amazing. We had about 230 projects in 2018. Those projects have increased in the past two years. That was the last snapshot we took.

Q237 **Katherine Fletcher:** Dr Kaleshi, I want to stop you. I want to make sure I can capture this stream of genius that is coming towards us. We are very good academically, but when it comes to starting to translate it into vendors, to industrialise it, perhaps we are not so good. I just heard you mention the Digital Catapult. What is the very simple explanation of what the Digital Catapult is, and how is that going to help to increase vendors and put a bit more resilience in the chain? I could hear brilliance coming out, but perhaps help us mere mortals to stay with you.

Dr Kaleshi: I apologise, Ms Fletcher. The Digital Catapult is leading advanced digital technologies. Our mission, as given by the Government, is that we are a commercial independent organisation, but funded by the Government, by Innovate UK/UKRI. The singular mission is to support meaningful adoption of advanced digital technologies.

We focus on four advanced digital technologies: future networks, 5G and IOT in particular, both infrastructure and the application space; artificial intelligence immersive; and distributed ledger technologies or distributed systems. We particularly specialise in the uptake of those technologies in the manufacturing and creative sectors. Our mission is to intervene in cases where, pretty much like Ms Karam's earlier comment, there is a

slowness or potential market failure of the market-driven innovation approach that the UK is brilliant at, but does not work all the time. We are discussing one of those examples today.

We intervene by particularly focusing on what we call the golden dust of innovation, which is the SMEs and start-ups. We connect them with the challenges that come from established industries and big players, and very often we help them in what we call a technologically non-partisan way. We do not favour one particular technology. We advance the technology that is best for a particular solution in a particular sector. Our intervention is commercially neutral; it is to connect them and help them in understanding the early stages of particular advanced technologies, what the road maps in the UK and the world are and how they can align those technology road maps in the world with their particular product road maps in order for them to scale up.

Q238 **Katherine Fletcher:** To use a horticultural analogy, we have loads of seeds going into the ground and you are spotting the ones that perhaps just need a bit more help to germinate to reach a commercially viable scale in the short, medium and long term.

Dr Kaleshi: Yes. In particular, we will be looking at that in the short and medium term; in the medium and long term, we will work with the universities to identify directions of work, and more broadly with the rest of the stakeholders, including regulators and industry, to identify the longer-term R&D elements to try to streamline and define the kinds of golden threads between the immediate necessity in the market and where technological development goes in the future.

Chair: Could we keep answers short, please? If we don't, we will run out of time, which would be frustrating.

Q239 **Katherine Fletcher:** Effectively, is that part of the UK's national telecommunications lab, Dr Kaleshi?

Dr Kaleshi: It is part of it; there are parallels. There are several initiatives that require very careful co-ordination at the moment, because the national telecoms lab, as discussed at the moment, is primarily a facility to address the ability to do cyber-security testing.

Q240 **Katherine Fletcher:** We have heard from others; you mentioned our previous sessions. We asked what we could do to increase the number of vendors in this space. They talked about effectively creating a really good pilot site that allows people to test. Is that correct?

Dr Kaleshi: In my view, it would not be a singular site. The expertise is distributed across the country, so it would be a site with a federated hub and spoke model that would leverage the human capital where we already have a critical mass of brilliance, as you put it, which genuinely exists out there.

Katherine Fletcher: It does.

Dr Kaleshi: More importantly, to provide a structured, co-ordinated and governed facility it would not necessarily have to be placed in one location; it does not need to be a new building.

Q241 **Katherine Fletcher:** It is a virtual world. I am absolutely fascinated. Time presses us. Could I ask that you write to the Committee to say what the asks are from the Digital Catapult around getting that set up and helping the UK play a role. I notice that Ms Karam wants to come in, so I turn to her and say, Hello, lovely jacket. How can I assist?

Amy Karam: Thank you so much. It is brand-new.

Here are my quick suggestions. Canada has a similar challenge. Sometimes, we try to expect everything from those pools of genius—the innovators, researchers and big brains. To go back to your original question, how do we all work together? How do the Five Eyes work together? The Americans are excellent at commercialisation; they are born with capitalistic blood in them. It is the American dream. It is also because they do not necessarily have subsidised healthcare, and that makes them a bit more motivated.

Katherine Fletcher: We'll stay off that one for the moment. Let's stay with 5G.

Amy Karam: My suggestion is that, maybe as you pull together and collaborate, one arm of the alliance is the commercialisation, go-to-market expert, and the UK and Canadian brains funnel that.

Q242 **Katherine Fletcher:** You draw my mind to the last question I want to address to both of you. We are busy negotiating a load of free trade agreements with Canada, America and all the other people we have mentioned repeatedly. How important is the inclusion of intellectual property rights in those free trade agreements to allow collaboration? Are there barriers? Am I worrying about nothing, or do we need to make sure we get that right? I see Dr Kaleshi smiling at me, so I will turn to him and then return to you, Ms Karam. IP: do we need to sort it?

Dr Kaleshi: The Committee has a specialist in that area. The blood that funds telecoms R&D is around IP. All of the collaboration agreements for all of the research projects that everyone does are very directed by IP. At Digital Catapult, we particularly do not go after IP because our mission is to help others to succeed rather than ourselves. I will put it out there, but IP is not my primary area of expertise. It is an extremely important point, even within one nation, let alone when we look elsewhere.

Q243 **Katherine Fletcher:** Ms Karam, is IP a problem that we need to solve, or are we in a decent space right now?

Amy Karam: Are you asking whether it is a problem if we share it across allies?

Q244 **Katherine Fletcher:** No. Are there any issues with IP at the moment that are preventing us collaborating effectively in almost the specialist-

type model across nations that you have just articulated?

Amy Karam: I do not believe so if there are positive intentions. For example, if you create it in a joint venture context, intellectual property is generally shared. There are rules around it. You might draft the agreement such that each nation owns the IP for a certain centre of excellence or a certain area of expertise—

Katherine Fletcher: I am sorry to stop you. I am really conscious of time. What I heard from both of you is that it is a question of trust in the commercial relationships more than any intergovernmental agreement, but it is important to get it right.

Q245 **Chair:** Dr Kaleshi, we have been talking about industrial strategy and anticipating the need, in this case, to have 5G capacity available to us. The Digital Catapult is one of our principal institutions for advancing industrial strategy, and it has been going for nearly 10 years, I think. What is your reflection on why we have not been able to get to where we are, notwithstanding the fact that we have created an institution to help us?

Dr Kaleshi: It is an extremely good question. There is a Catapult network and some of them have been created for many years. The Digital Catapult is a new creation; it was established in 2014. We identified immediately, in 2015, that our primary strategic goal would be to try to link better the development and change that was coming with 5G on the infrastructure side with its adoption. That has been the focus of UK Government strategy as well. We were an instrument to implement that particular strategy, but it has been all around the development and adoption of 5G as part of what we call the DNA of the digital economy—the data, networks and artificial intelligence. Networks are always the poor cousin who is very often forgotten, but 5G is exposing that and is making them very important.

It is maturing and it is a very big juggernaut that will require a bit of time to turn, but I am extremely confident that we are at the right time to consider it. Awareness in both academia and the adopting industries—manufacturing, logistics and automotive, not just the mobile industry—has gone up sufficiently, including in the Government, to understand that something significant can happen, and needs to happen in a co-ordinated way.

Q246 **Aaron Bell:** Ms Karam has already covered OpenRAN as a good thing in the long term. Dr Kaleshi, is it the right end goal for the UK's 5G capability in the long term? Is that what we should be working to?

Dr Kaleshi: In the medium term. We can start something immediately on testing and working in that space, but it is a mechanism to look at international standardisation, so it is an intermediate goal.

Q247 **Aaron Bell:** In the UK, what long-term Government oversight would you need to get us to that long-term goal through the Digital Catapult or any

other means?

Dr Kaleshi: The primary one is a comprehensive R&D strategy looking forward to 2030 and beyond, in positioning and taking a very long-term view of telecoms. That should be associated with immediate pragmatic and practical steps to leverage all we have at the moment, in particular the assets—the testbeds that we have—and the human capital that has been created, and to explore, for example, what OpenRAN means. These are long-term evolutions. In the next six months to a year, we can do something immediately while we think about the longer-term strategy. We need to streamline the immediate steps with what we need for the medium to long term. Those discussions have already started.

Q248 **Aaron Bell:** You mentioned testbeds. You have obviously had experience running other 5G testbed programmes. How would you see an OpenRAN testbed operating, and what support would that need?

Dr Kaleshi: We have an absolutely excellent—probably the best in the world—understanding of the ecosystem, not purely in the Digital Catapult, for how we build and use testbeds. That could be very similar to a combination of the existing testbeds that are already built from UKRI and DCMS, with interconnected facilities at national level, similar to those we have in the INITIATE project and the national dark fibre infrastructure, as well as existing testbeds in various universities, industry and technology organisations like Catapult, including the regulator. The regulator should not be forgotten in the research, development and innovation strategy that we need to put in place.

Q249 **Aaron Bell:** Are you already working on OpenRAN in the Digital Catapult, or is that not happening yet?

Dr Kaleshi: In our 5G testbed, we have already started an investigation of those things. In our 5G testbed in the Catapult, which is an investment of about £1.5 billion, we have deliberately gone down a non-vendor specific route, so we mix and match from different suppliers and we do the integration ourselves, which gives us the flexibility to engage very early on. It is a good playground for exploring these things very early on.

Chair: I thank our two witnesses, Ms Karam and Dr Kaleshi. It has been great to be able to pick your brains and explore your technical knowledge. You have helped us with our inquiry, and we are very grateful. Perhaps we can follow up with further questions we might have arising from the session. We thank you both.

Examination of witness

Witness: Oliver Dowden MP.

Q250 **Chair:** We are very pleased to have with us today the Secretary of State for Digital, Culture, Media and Sport, the right hon. Oliver Dowden. Secretary of State, I start by thanking you very much indeed for coming before the Committee. Just a week ago, when I questioned you on your

statement in the Chamber of the House of Commons, I invited you and you accepted with alacrity. We are very grateful to you for coming. Perhaps you could give our thanks to the Minister for Digital Infrastructure, Matt Warman, who has been very helpful to the Committee in this inquiry.

Obviously in our minds is the future of 5G, which has been materially affected by the decision that you announced to the House of Commons last week, so you will understand that we want to spend quite a bit of time on that. What does it mean to be a high-risk vendor, which Huawei was declared to be some years ago?

Oliver Dowden: It is a combination of factors, looking principally at where the supplier is located, and the risks there. In this instance, the two principal high-risk vendors that we have identified are Huawei and ZTE. Clearly, we are mindful of issues such as the Chinese intelligence laws and the requirements for companies operating out of China to comply with them. It also goes to the security of the system—the actual standards involved.

Q251 **Chair:** It is both. In the case of Huawei, or the two companies that have been deemed to be high-risk vendors, do you have concerns about both limbs—the technology and whether there are links to the state?

Oliver Dowden: Yes. It is worth saying first that we make decisions about deeming a vendor high risk based on advice from the National Cyber Security Centre, which works closely with GCHQ.

It is in respect of both those limbs. To be clear, it is an understanding of the relationship of how companies operate out of China, and the security and standards of those vendors. For example, we set up the Huawei Cyber Security Evaluation Centre, so that we can monitor, understand and address those risks.

Q252 **Chair:** Will that evaluation centre continue, given the decision that you announced last week?

Oliver Dowden: The centre will continue. There are challenges for the centre, given the impact of the US sanctions. Strictly speaking, in legal terms, while the employees are determined and vetted by GCHQ, it forms part of Huawei, and the reason for that is to protect Huawei's intellectual property. Given that access to Huawei equipment will be severely impacted by the US sanctions, we are exploring how we can, essentially, continue to have access to the equipment that it needs to continue to consider.

Q253 **Chair:** And who will pay for it?

Oliver Dowden: Huawei has always paid for it in the past, and there is no reason to believe that will change.

Q254 **Chair:** Have you agreed that it will continue to pay for it in the future?

Oliver Dowden: We have not had specific discussions about that since the announcement, but I have no reason to believe that it would not be the case, and we will continue to pick that up with Huawei if there are any issues.

Q255 **Chair:** What are the running costs of the evaluation centre?

Oliver Dowden: I am afraid that I cannot give that to you now, but I am happy to write to you on that.

Q256 **Chair:** It is millions, I assume.

Oliver Dowden: Yes.

Q257 **Chair:** Tens of millions?

Oliver Dowden: I do not have the number to hand, and I would rather write to you and give you the specific number, if that is okay.

Q258 **Chair:** That's fine. We would be grateful if you would.

On the risk in the networks, is it possible to trust the equipment used by Nokia and Ericsson, for example?

Oliver Dowden: There are risks in relation to the entire telecoms network. That is an important point to understand about all of this. I am sure that members of the Committee appreciate that one cannot design a perfectly secure telecoms network. What you can do is to improve telecoms security standards. That is why we had the review of telecoms security, which gave rise to the initial and subsequent guidance on high-risk vendors, which we will seek to put into law through the telecoms security Bill.

The other two vendors are not UK companies, so there are risks in terms of our site[1] outside the UK and risks through the supply chain; indeed, there are risks in respect of deployment within the United Kingdom. In respect of all those areas, there is potential, if a hostile foreign state is minded to try to gain access, at points all across the supply chain.

The point of having the National Cyber Security Centre and its advice is that it gives us two forms of comfort. One is that it helps to guide the standards, and more rigorous standards will be set out in more detail in the Bill when we bring it forward. Secondly, it guides us on risks from specific vendors.

Q259 **Chair:** One of the concerns about the US sanctions regime was that it would disrupt the supply of chips to Huawei, and that they might need to be sourced from China. Have I got that right?

Oliver Dowden: I think it goes more to the intellectual property on which the chips rely. It uses US patents, and Huawei will no longer be able to rely on those US patents. The NCSC has concerns about whether

[1] Note by witness: Oliver Dowden says 'sight' not 'site'.

Huawei has the capacity immediately to fill the gap created by the loss of US patents and, as a consequence, no longer has confidence that they will be able to fill that gap.

Q260 **Chair:** Where the chips and components are manufactured is not of concern.

Oliver Dowden: No, the concern is about the underlying intellectual property.

Q261 **Chair:** It is the case that other vendors source components from China.

Oliver Dowden: Yes, and we were aware of that situation when the initial advice was issued by the National Cyber Security Centre both in January and prior to that, and the NCSC decisions were based on that.

Q262 **Chair:** Ciaran Martin, the head of the National Cyber Security Centre, in evidence to the Defence Committee, said that we cannot trust any of the equipment of any of the vendors. He said: "We do not trust any of the equipment." Given that, why is there not an equivalent of the Huawei evaluation centre for other vendors?

Oliver Dowden: I haven't read the full extent of his comments, but what I take from what you have said is that he is making a point similar to mine, which is that there are risks inherent in all vendors, for the reasons I set out previously and will not go through again. But there are heightened risks in respect of Huawei, which is why we have deemed Huawei a high-risk vendor. It is why we put the initial restrictions on it in January, and why we are reliant on the evaluation centre, because of its status as a high-risk vendor. It is all fact and degree, but the fact that we have deemed it a high-risk vendor means that we need to take further steps in respect of our understanding of it, which is why the centre was set up.

Q263 **Chair:** But if you cannot trust any of the equipment, would it not be prudent to have a means to analyse and evaluate the equipment from all the different sources, if they are deemed to be untrustworthy?

Oliver Dowden: It is because of specific concerns about a high-risk vendor that we set it up for Huawei. We do not have the degree of concern about the others that would necessitate setting up a specific evaluation centre, but of course the National Cyber Security Centre will look at all vendors, and has done in the advice it has given us.

Q264 **Chair:** But we look at the technology from those other vendors.

Oliver Dowden: Yes, we do. It is just that a higher level of understanding is required in respect of Huawei.

Q265 **Chair:** When Ciaran Martin said, "We cannot trust any of the equipment," he went on to emphasise in the next sentence, "That is important." He wanted to underline the fact that it is other vendors and not just Huawei, in that respect.

Oliver Dowden: I was keen to underline that point both in the debate we had back in March and, indeed, in the statement I made to the House. There are risks in all vendors. We cannot have perfect knowledge of all the employees and the full extent of the supply chain.

In response to that, first, we manage the risk by imposing restrictions on telecoms security. The essence of the Bill that I will bring before the House in the autumn will be about shifting the presumption from the Communications Act 2003, whereby it was essentially for the mobile operator telecoms companies to determine how best to address security questions, with the burden lying principally on them, through to us, the Government, setting out in much more detail the sort of measures that need to be taken to improve security.

That is principally how we are addressing those risks, and then there are further steps in respect of high-risk vendors. Initially, that was to have the cap, and the ban from core and sensitive areas. Subsequently, because of the US sanctions, we are stopping the supply of Huawei equipment to 5G and setting out the path for removal.

Q266 **Chair:** The change in policy was because of the new US sanctions regime. That is the case, is it not? Would our policy change if the US sanctions regime changed?

Oliver Dowden: We could continue to keep it under review, but that is a somewhat unlikely scenario, given that there is pretty much bipartisan consensus, so I have no reason to believe that a change in the US presidency would change that position. If anything, what we have seen over previous months and years is that there has been a tightening, and there is no evidence that there is going to be any loosening of those sanctions.

Q267 **Chair:** You envisage allowing seven years to remove Huawei's equipment from the 5G network.

Oliver Dowden: Yes. We have set out a timetable for the full removal by the end of 2027.

Q268 **Chair:** Does it need to be done progressively throughout, or can it all be done in the last year?

Oliver Dowden: I would not expect it all to be done in the last year. It is not in the commercial interests of the companies, and I do not think that they would have the capacity to remove it all in the last year. I would expect them to remove it over the course of that period of time.

Q269 **Chair:** You would expect them to, but would you require them?

Oliver Dowden: We have not set out that requirement now, but it is something we will keep under review.

Q270 **Chair:** You said that the policy would cost £2 billion and delay the roll-out of 5G by between two and three years. What is the basis of that

assessment?

Oliver Dowden: Two things that sort of work together. We have had conversations—clearly, there is commercial confidentiality around them—with each of the mobile network operators to understand what the costs would be. Then that is overlaid with our own analysis, working with NCSC.

It is worth breaking out the different elements of that analysis. If you remember, when we imposed the cap and ban back in January, it already imposed a significant cost; the rough impact was around £1 billion and a year's delay. In addition, further costs were imposed by stopping the flow, which was the announcement about no new equipment coming in from the beginning of next year. Then there are further costs on top of that from the removal of the stock and the timescale going to 2027.

Q271 **Chair:** It would be helpful if you could write to the Committee and set out the components of that.

Oliver Dowden: Yes, of course.

Q272 **Chair:** Given that the whole policy environment is about reducing the risk that we face as a country, did you make an assessment of the risk that Nokia or Ericsson could be taken over by a company, perhaps a Chinese company, which might give rise to the same concerns that you had over Huawei?

Oliver Dowden: Yes. I need to be very careful not to comment on the specifics of each individual company, but we are very mindful that the biggest single immediate risk to diversification would be to lose another vendor. That features very strongly in our considerations and discussions.

Q273 **Chair:** When you consider it and discuss it, what action has it impelled you to take?

Oliver Dowden: As part of our diversification strategy, which I shall set out and publish in full when I introduce the telecoms security Bill, we will look at three pillars of diversification. The first pillar is about securing incumbents. The sort of thing we would look at there is, first, the underlying capital position of companies to see whether further steps would have to be taken in respect of that. It is also about looking at the markets for incumbents, at whether there is a sufficient market not just in the United Kingdom but across the rest of Europe, working with our allies across Europe to understand that, and working to understand whether they have sufficient technical capabilities and expertise. As I say, that is the first immediate risk, and we do not want to lose that.

Chair: Thank you. We will go into a bit more detail on that later in this session.

Q274 **Katherine Fletcher:** Hello, Secretary of State. I would like to pick up the thread from the Chair. We have a couple of vendors who are not categorised as high risk, Nokia and Ericsson. What are we doing to

support those existing vendors, outside assessing capital structures and making sure that they are not vulnerable?

Oliver Dowden: First, we have very good relationships with them. The Minister for Digital Infrastructure has met all of them and continues to do so on an ongoing basis. Secondly, we are looking at how we can continue to support those incumbents. As I said, that means ensuring that there is a sufficient market for them. Broadly speaking, the telecoms market splits into three zones, Asia, the US and Europe, so it is about ensuring that there is sufficient demand within Europe.

We are also looking to enhance their competitiveness. One of the principal things that we have already done to enhance the competitiveness of Nokia and Ericsson is, through the telecoms supply review and the guidance and legislation that will follow it, to enhance security levels and requirements. Given that they already have quite high security requirements, that in itself is helping them, inadvertently.

Q275 **Katherine Fletcher:** You mentioned security. Have you done any assessment of whether retaliatory disruption could occur from China or another source? How vulnerable are the likes of Nokia and Ericsson to that?

Oliver Dowden: Of course, we keep all those things under review, and receive advice and intelligence in respect of them. Clearly, one begins to get into the realms of speculation, but we are mindful of where risks could arise.

Q276 **Katherine Fletcher:** Understood. We have just heard some very compelling evidence about the idea of the Five Eyes, the western security coalition countries, working together perhaps to create a new vendor of telecoms equipment. Have you assessed that idea? Do you think that it is viable? Can we bring new entrants into the market?

Oliver Dowden: Yes, there are two respects in which we can do that. The first is to take an existing vendor that is not currently in the UK market and encourage them to come into the UK market. We have had productive discussions with a wide range of vendors; the reality is that Samsung or NEC would be the most well placed to enter the UK market, although there are significant challenges around that.

In the medium to long run—I caught this at the end of your previous witness session—OpenRAN is the solution in a number of different respects. First, there is potential to co-operate and have mutual interest between us and our allies, whereby we have interoperability between different parts of the vendors. The components that make up what the vendor has to offer mean that there are opportunities for different countries. For example, the UK has strength in software, so there is potential for us to build software capacity, and potential for other countries to build other elements of it, and there is potential for us to work with them in driving rules and standards for that.

That is probably the principal area of future co-operation. None the less, even in respect of bringing in new existing vendors, there are ways we can work together, particularly around understanding how we can help them to build market share.

Q277 **Katherine Fletcher:** We heard from Mr Kim at Samsung, who said that it might be easier to create a stand-alone 5G environment and have it completely separate from the existing network, to aid speed and the ability for other vendors to come in. Is that something that you would consider requiring operators to be able to deploy—stand-alone 5G or separate spectrum?

Oliver Dowden: What we are trying to do in respect of new entrants is twofold. First, it is helping them to come into the UK market and overcome some of the quite considerable barriers that they would face in doing that— for example, the length of the investment required, the R&D and so on, and the economies of scale. Secondly, as we move to OpenRAN, it is about looking at the different opportunities within OpenRAN for them. That is where the focus is of our work so far.

Q278 **Katherine Fletcher:** Let me play that back. The focus is more on creating a collaborative environment where lots of people can play and talk in the same language, rather than having a set of end-to-end stand-alone provisions with different providers. The OpenRAN model is what you are favouring to help us to get access to the service that we vitally need in areas of poor rural broadband, for example.

Oliver Dowden: There are a number of different points there. In the short to medium run, we are going from a situation where we had three 5G vendors to having two 5G vendors. For purposes of diversity, competition and resilience, it would be preferable, in the short to medium term, to have another vendor. That is the first strand of work, and Samsung and NEC seem to be the most likely to fill that gap.

In the medium to long run, particularly with a view to how we develop UK commercial interests and resilience, the preferred model would be to get to the OpenRAN solution. There is only one country in the world, as far as I know, that has a full OpenRAN network, and that is Japan, and it was started from scratch. We cannot immediately jump to OpenRAN. While we will take steps to support and drive OpenRAN—for example, with 5G testbeds and so on—we will have to work to get a new vendor in as well, to fill the gap as it were.

Q279 **Katherine Fletcher:** Do you have any idea of timescales for when we could expect that?

Oliver Dowden: We are working on having it as soon as we possibly can. The effect of the decisions that we took last week has meant that the need is even more pressing. I have been discussing this with the Prime Minister before and after. We are looking at ways of turbocharging the process. For example, I intend to set up a taskforce to drive it, and to appoint a senior person from the commercial sector in telecoms to lead

that taskforce. The Prime Minister and I will task him to take each of the three elements and advise us and help us to drive them as hard and fast as we can—securing the existing incumbents, getting in a new one and driving OpenRAN.

Realistically, for OpenRAN, we are talking about a four or five-year timeframe to get it fully up and running. Clearly, in the intervening period, we will work to develop OpenRAN, whether that is through testbeds, working with our partners or securing the standards for it. In that intervening period, we would want to try to get a new incumbent in. I am heartened by the fact that Nokia and Ericsson say that they will be able to step up to the plate and fill the gap from Huawei, but I still think that we need to get another vendor in.

Q280 **Katherine Fletcher:** I do not envy your position, Secretary of State, because you have communities that could hugely benefit from 5G, which have quite poor access to the internet at the moment, and you have a trade-off between giving them access as soon as possible and securing the network. Can you see a scenario where we pause to get it right, rather than locking in a limited supply chain if we push for speed in the near term? Can you see that being a trade-off that we face immediately?

Oliver Dowden: No, we would not seek to pause it. I have already outlined to the House, and briefly to the Chair, the delay to 5G roll-out caused by the decisions that we have taken. It is worth noting that one of the biggest challenges that I see from rural communities is in relation to fixed broadband provision. The single best thing that we can do immediately is to fill the gap of the remaining 4% of households that do not have access to superfast.

Superfast is enabling this conversation to take place, as well as countless other Zooms—millions of them—up and down the country, and enabling people to download their Netflix and Amazon and so on. Getting gigabit-enabled full fibre is about the technologies of the future; the mobile version of 5G and the low latency that you have with 5G will enable the technologies of the future, such as driverless cars. Those are initial ideas that people have, but it is worth noting that, although people foresaw that 4G would facilitate technological innovation, I do not think that when it was first mooted people saw that it would lead to Uber Eats and all those other applications.

We are doing the job of government, which is to lay the infrastructure that then enables private companies to innovate, flourish and exploit that infrastructure. World-leading countries, whether South Korea, Spain, France or the United Kingdom, are seeking to do that to give the capacity for new technologies to emerge.

Katherine Fletcher: I look forward to it. Thank you very much indeed.

Q281 **Chair:** I want to follow up a couple of Katherine's points. Samsung were very clear that they would like to enter the market, but they do not make

the legacy equipment—the 2G and 3G equipment—that is required to offer services to the networks at 5G, so they would benefit from having a mandated requirement for a stand-alone network. What is your view on that?

Oliver Dowden: It is precisely those sorts of technical discussions that we are now moving to with Samsung and NEC. We have got to the point where they have both shown an interest in principle in entering the market. In respect of 2G, it is slightly separate in that it is a technology that is going to be around for quite a long period of time. It is relatively low tech and we are well used to the existing vendors, so we are less concerned about that from a security and ongoing perspective.

Q282 **Chair:** But that is not the problem. The problem is that, in order to be able to supply to the networks, Samsung would have to develop a capability that they do not have in 2G, because the non-stand-alone network is built like layers of sedimentary rock, one on the other. It would require Samsung to do something that, literally, has no commercial future, just for the purposes of coming in at 5G.

Oliver Dowden: There are two answers to that question, as it were. The general answer is that we are having precisely those sorts of conversations with Samsung in detail, to understand the barriers they face at a technical level, and we have an open mind as to how we could achieve that.

Q283 **Chair:** Does that open mind extend possibly to mandating a stand-alone rather than a non-stand-alone network?

Oliver Dowden: Yes, I have an open mind in respect of all of those things. The whole point in terms of the direction of where we are going is that we want to ensure that we maximise the speed of the diversification and the sort of mandate that we will give to the new chair of the taskforce. Indeed, the mandate that we are giving officials and NCSC is to do whatever is necessary, and then we will evaluate the costs and benefits of each of those things.

Q284 **Chair:** In the previous session, one of the witnesses suggested that we should pause, or at least be prepared to go slower on, the roll-out of 5G in order to reset our approach, which perhaps should have been done differently some years ago. They said that it was better to do that and to forgo some of the early advantages from using 5G. Is that your view?

Oliver Dowden: We have already slowed, as a result of the decisions that we have taken, by two to three years. That in itself will create some space, but it is not my view that we should have a pause, no.

Q285 **Chair:** In terms of the aspiration to diversify the supply chain, when you spoke to the House of Commons in March you made what you described as a very strong commitment to develop new supply chain capacity in this Parliament. Is that still your commitment?

Oliver Dowden: Completely, yes, and I will set out in more detail where we have got to in respect of the three strands in September, and the steps we are taking to drive that further and faster.

Q286 **Chair:** That is the diversification strategy presaged in the 2019 supply chain review.

Oliver Dowden: It is important to say that we are not drawing up the review and not doing anything, and then publishing it and starting it. All the work is ongoing and all the engagement is ongoing. The review will set up where we have got to already, and where we are going next. There is a legitimate concern from Members of Parliament, which I saw both in the debate and in the statement yesterday. People want to be reassured, given that we are losing Huawei, and given the risks around lack of diversification, that we have a clear plan, and we must set that out in a way that can be scrutinised by Members.

Q287 **Dawn Butler:** I lost the signal for a moment, so I am not sure if part of this question was answered. Thank you, Secretary of State, for coming to the Committee today. I understand the pressures of getting to grips with a brief such as this. I want to talk a little about horizon scanning and how far ahead we are looking in the UK. Are we looking two, five or 10 years ahead as regards R&D? You talked a little bit about expanding our vendors, because having two vendors makes us less safe. How far ahead are we looking?

Oliver Dowden: We have a long timescale; certainly, through the NSC and the integrated review, which is looking at our wider security and defence capabilities, we are looking forward 20 years-plus. How we deliver on the three elements of diversification that I have set out will inevitably link through to wider, longer-term conversations. For example, we will have to work across Government, particularly with BEIS, in developing our longer-term industrial strategy. That will in turn relate to the national security and investment Bill that BEIS is bringing forward, and how we help to foster and protect homegrown capability, particularly, for example, in relation to the OpenRAN solution. It is about taking a long-term view on how we work across our allies, starting with the Five Eyes partnership and going through the G7 and our other European allies, as well as other countries such as those identified in the D10 grouping. All those things are actually, by their nature, long term.

A lot of what underpins it—the Prime Minister made this point in a speech to the UN back in September—is that the United Kingdom was at the forefront of previous industrial revolutions because we shaped and set the standards, whether around accountancy or through Bretton Woods and all those sorts of things. We are now setting the standards for the next century around telecommunications, artificial intelligence and all the emergent technologies, so the longest-term thing we need to do is to ensure that the United Kingdom and our allies are well represented on those bodies and that our values are well represented on them—that is to say, openness and transparency.

Q288 **Dawn Butler:** I wish we were setting the standards. I think China is ahead in that game, and, as we were saying in the previous session, we may not be able to catch up, but we could leapfrog over. What kind of investment is going into horizon scanning over the next 20 years?

Oliver Dowden: We are very mindful, and have been discussing with colleagues, including at Cabinet level, that we will clearly have to make a bid as part of the spending review process to ensure that we have sufficient resources to enable it. If we want to encourage OpenRAN, and we want to invest in 5G testbeds and so on, there will be costs associated with that. Part of the diversification strategy will involve a spending review bid, which will go through the normal process.

Q289 **Dawn Butler:** We do not have an actual spending review commitment to finances or investment at the moment. Is that correct?

Oliver Dowden: The spending review is coming up in the autumn. I think the Chancellor has made it clear that it is coming. We have already invested a huge amount in this area; we are committed to £5 billion investment in relation to ensuring that we get gigabit broadband. In addition, we have a whole array of testbeds.

I am happy to write to the Committee in more detail, but, for example, we recently launched the £30 million available for the 5G Create competition, we have a £1 million collaboration with the Government of South Korea, and we have another £6 million for industrial testbeds and trials for 5G. There is rolling work, but clearly, as we look forward, we will need to look forward in our further ambitions and then get the spending commitments, as part of the normal process that any Department would go through.

Q290 **Dawn Butler:** You referred to the 5G testbeds. The trials programme was announced in 2016. What impact has it had on telecommunications market diversification so far?

Oliver Dowden: I think it has in a number of respects. First, it is about understanding how we apply 5G on the ground, ensuring that we have understanding across the board of how we can roll out 5G securely. Increasingly, though, we have a focus on ensuring that we test OpenRAN. For example, the recent tests and trials in Orkney and the Chess valley are testing OpenRAN. As we develop the strategy, I would certainly look to ensure that we get sufficient funding and investment to have much more extensive testbeds and trials for OpenRAN.

Q291 **Dawn Butler:** On OpenRAN, is it really starting to deliver in terms of diversity in the telecommunications market in the UK?

Oliver Dowden: Not at the moment, no, because we do not have an OpenRAN network. We are developing the building blocks of understanding and application that will enable us to have an OpenRAN network. As I said, only one country in the world, Japan, currently has OpenRAN; one of its networks is OpenRAN.

We need to get to the point where we have one, but there are many elements to that, such as the standards that underpin OpenRAN and working with allies to ensure that we have those common standards, and encouraging participants. The conversations that we are having with a number of vendors are looking at that. It is about building up the process to get to that point. As I said in previous answers, in the short run we need to get a new vendor in place, Samsung or NEC, and in the medium to long run we need to get an OpenRAN network.

Q292 **Dawn Butler:** When you say long run, what does that mean? What is the long run for you?

Oliver Dowden: I think we are looking at around a five-year horizon to actually get an OpenRAN network up and running.

Q293 **Dawn Butler:** In the Department, what kind of expertise do you have around this issue?

Oliver Dowden: We have very experienced and capable civil servants who advise us, who come from that background and have come up through the system. We work incredibly closely with GCHQ and the NCSC. I believe that Ian Levy has given evidence to you. I work very closely with Ian Levy and Ciaran Martin on this. In addition, particularly to drive the commercial application, I am keen to, and will, appoint somebody to chair a taskforce to ensure that we give the next charge forward to what we are doing.

Q294 **Dawn Butler:** Do you have somebody with expertise in the Department to chair that taskforce? The reason I ask is that I think that, to get the best possible outcomes, you need friction when it comes to technology; you need someone almost to match them at the same level. Do you have anyone in the Department who is capable of chairing that taskforce?

Oliver Dowden: Actually, you make a very valid point, and that is precisely why I would look to somebody external to lead the taskforce, to do two things. First, it would provide that friction and challenge. I am very well served indeed by the Minister for Digital Infrastructure, who has a strong background in this area, but with the best will in the world, given the speed and pace of the technology, you need to supplement ministerial understanding with direct commercial understanding. That is precisely what I would be looking for in the chair of the taskforce. I have some names under consideration, and hope to announce that as part of the diversification strategy that I lay before Parliament alongside the introduction of the telecoms security Bill.

Q295 **Chair:** In terms of that diversification strategy, in your answers so far you have not mentioned satellites. Yet in advance of the spending review and the publication of the strategy, the Government have taken a 45% stake in a bankrupt business called OneWeb, for £400 million, and part of the proposition is that it delivers 5G capability. Were you part of the discussions around that?

Oliver Dowden: Yes, and my Department fed into the analysis that underpinned it. There is potential for the use of satellite technology, but at the most remote and hardest-to-reach areas. As you roll out gigabit-enabled broadband, it is through the fixed networks or 5G. As you get to the furthest and most remote points, and the marginal cost gets much higher, you start to get to a point whereby the marginal cost becomes lower from satellite technology than putting in additional infrastructure, whether that is laying cables or putting in base stations. In closing that last gap, there is potential for the application of satellite technology, but, to be clear, the acquisition is not just to secure that; it is one consideration that forms part of the wider case. Clearly, that is being led by BEIS.

Q296 **Chair:** But it is one of them; it will make a contribution to completing a 5G connection.

Oliver Dowden: Yes, satellite technology will be able to do that, and we believe that there is potential through OneWeb to do that.

Q297 **Chair:** Did you and your Department recommend that the country take the stake that we did in it?

Oliver Dowden: We said that there was potential; it would not have justified purchasing OneWeb on its own, but there is some benefit, which we fed into the business case for doing so.

Q298 **Chair:** Would it be part of the diversification strategy to go beyond reliance on two vendors? Obviously, it is a different technology, but does it help with diversification?

Oliver Dowden: Yes, it will help with diversification. I do not want to overplay the scale. As I say, it is very much at the edge and in the most remote areas, and, necessarily, that is going to be quite a small proportion of the network, so it will not suddenly transform things. It is another tool in the armoury, as it were.

Q299 **Chair:** But it would not be justified on 5G grounds, or the last few percentage connection grounds, alone.

Oliver Dowden: Not alone, but it forms part of the case.

Q300 **Aaron Bell:** Good afternoon, Secretary of State. Before I talk about international collaboration, are we looking to roll out testbeds to a wider scale? Are we going to have wider areas covered with test networks in the immediate future?

Oliver Dowden: Yes. We have had a drumbeat of announcements of testbeds, and I certainly expect that it will form a core part of the diversification strategy to continue to ramp up testbeds for OpenRAN.

Q301 **Aaron Bell:** It would be wrong of me to lobby for Staffordshire now.

Oliver Dowden: It is noted, and I am sure that you will do an excellent job.

Q302 **Aaron Bell:** On international collaboration, can I start as the Chair did by looking back before we look forwards? Did the Government receive advance notice of the US sanctions on Huawei?

Oliver Dowden: I can't actually tell you that. I imagine it would have come through the Foreign Office. I do not want to mislead the Committee. I would have to check whether I was formally notified in advance, but it did not come out of the blue. There were already sanctions previously; we had had extensive conversations with the Americans and others, and their concerns were in the public domain, so we knew the direction they were going in. We knew that further sanctions were under consideration and that there was tightening. Off the top of my head, I cannot recall whether we were specifically given advance notice of the sanctions.

Q303 **Aaron Bell:** If that is available and you can let us know, it would be great. Are the US Government still co-operating with our efforts to enable the Huawei Cyber Security Evaluation Centre to continue operating?

Oliver Dowden: We are having exactly those discussions about how we can achieve that.

Q304 **Aaron Bell:** We heard from our previous witnesses about the potential benefits of international collaboration, particularly starting with the Five Eyes. What co-ordination is already going on to support market diversification, or are these just sentiments that we ought to be doing it at the moment?

Oliver Dowden: The first step has been the agreement in principle, which has been readily coming forward from all our Five Eyes partners and, indeed, others. The next stage—we are starting on it, and I am working closely with the Foreign Secretary—is to translate that desire to work together into specific asks and collaboration. That goes across all the different streams. In relation to securing incumbencies, it is looking at how we can work together on that, as well as getting in a third vendor, particularly in relation to OpenRAN. The United Kingdom alone cannot, by definition, set the standards for OpenRAN; we want to have an OpenRAN that works across different jurisdictions, and everything else. Secondly, there is potential for mutual benefits, with different countries having different specialisms within the OpenRAN.

Q305 **Aaron Bell:** That is already in hand, clearly. You mentioned the D10 earlier; is there advance co-ordination regarding that, or is it something that it would be nice to have down the line?

Oliver Dowden: Discussions have taken place with all the D10. This comes up in G7 fora; the G7 make up seven of the D10. The others are Australia, India and South Korea, and we are having good discussions with all of them. Indeed, we have a lot to learn particularly from Japan and South Korea about advanced technologies, and, clearly, we have a lot of common interests with Canada and the United States, which are

both Five Eyes and G7 countries, as well as with Australia and New Zealand.

Q306 **Aaron Bell:** Not all those countries are taking quite the same line on Huawei. In those discussions, how are we managing that in an overall approach to telecommunications security they will be happy to buy into in the future? Are they going to persist with Huawei while we go our way?

Oliver Dowden: Regardless of the stance that countries take on Huawei, most countries look forward and see that OpenRAN is a good, secure solution that provides opportunities for them. I do not think that there is a tension between the two. Even were you minded to keep Huawei in your networks, it would still be beneficial to build towards an OpenRAN system.

Q307 **Aaron Bell:** You have already mentioned standards. How concerned are you about China's expanding influence on the standards-setting process?

Oliver Dowden: It is perfectly understandable that China, as an emergent and indeed emerged power, and a country with huge commercial interests around the world, wants to take its legitimate place at the table in shaping those standards. We have to be mindful that we do not become complacent. We need to make sure that we are at the table, having those constructive discussions, and that we have our place in those conversations. That is why we are prioritising ensuring that we have a role in relevant international bodies.

Q308 **Aaron Bell:** Given China's overall ambitions, is there a risk that we will end up with separate, competing standards from this process, or do you think that we will keep global standards across the whole globe?

Oliver Dowden: I very much hope that we will be able to have common standards across the entire globe. That is clearly in everyone's interests.

Q309 **Chair:** I have a couple of final points. On the OneWeb satellite transaction, it is a communications satellite company. If the 5G contribution, connecting the last few percent of the population, is not sufficient to justify it, what is the rationale for taking the stake?

Oliver Dowden: I am afraid that you will have to address questions to BEIS and the Treasury as to how the full business case was made for it. Our role, as DCMS, was to advise on the implications for 5G and broadband.

Q310 **Chair:** But you are the communications Department, so the implication is that, if it is not around that, it is an industrial or financial investment, in effect.

Oliver Dowden: Indeed, there are wider considerations for those Departments, which is why they led on it, not DCMS.

Q311 **Chair:** To pick up some of Aaron's questions on international collaboration, your Department has a wide range of responsibilities,

obviously including digital but also the creative industries, culture broadly defined, sport, tourism and others, in which relations with China are notable in each case and there have been moves to expand them. Is the Huawei decision to be understood as a specific response to a specific problem, or is it to be seen as—to coin a phrase—a conscious uncoupling from China?

Oliver Dowden: It is driven by a specific response to a specific problem, namely the further and very stringent US sanctions. That is the principal and overriding consideration in respect of us taking these further measures. Ultimately, the National Security Council, chaired by the Prime Minister, takes decisions on this on advice from the NCSC, and the NCSC gives advice as to the telecoms security implications, which formed the essence of our concerns and discussions; but of course you would expect the National Security Council to be mindful of the wider geopolitics as well.

Q312 **Chair:** In terms of the aspirations that you have for the different industries in your Department to foster trade links, where they do not have specific security challenges, you would want those trade links to continue.

Oliver Dowden: Yes, and if you look at what the Prime Minister and others have said, which I fully endorse, first, there is clearly no issue with the Chinese people or, indeed, with the Chinese Government. We continue to engage with the Chinese Government. We are clear where we disagree. Indeed, there are many countries around the world where we have disagreements, but, at the same time, we can have very constructive areas of discussion, engagement and co-operation. I very much hope and expect that will continue in respect of China. I hope that China respects our position. We disagree in relation to Hong Kong and we have to act in relation to the impact of the US sanctions. It was not a knee-jerk anti-China move from us.

Q313 **Chair:** Indeed, some of those industries are areas that are much in demand in countries, including China, and have possibilities, if we want to follow the ambition to increase our trade.

Oliver Dowden: Indeed. The great opportunity for the United Kingdom post Brexit is to be an open, free-trading nation, underpinned by the rule of law and robust security measures, whether that is having a strong national defence, strong institutions such as GCHQ and others, and strong courts. It is about being a place where businesses based in countries all around the world, whether China, the US, the EU, India or wherever else, are able to come, provided that they abide by the rule of law. We are an open economy; that has always been the United Kingdom's strength, and I would expect it to continue.

Q314 **Chair:** Secretary of State, thank you very much. You have been very open with the Committee, and we are very grateful for your evidence. The inquiry will continue, because we are keen to look at how, as a

country, we can make a reality of the commitment that you have given to diversity in the telecoms supply chain. As you made clear in this session and as we have heard from other witnesses, that is not an entirely straightforward task to accomplish, but, nevertheless, it is a very important one. I hope that when we make a report, having taken some further evidence, you and your colleagues in government will reflect on our recommendations, which are designed very much to help.

Oliver Dowden: Thank you. I look forward it. We are very much open to further advice and suggestions to achieve diversification.

Chair: Thank you very much. That brings to an end this meeting of the Committee. As this is our last meeting before the summer recess, I put on record thanks not just to our witnesses in today's session and throughout our sessions and to my Committee colleagues, but to our team of Clerks, who organise our hearings, help to brief us, write our briefings and help us with our reports. We are very grateful for their hard work.

I also thank our colleagues who viewers cannot see but we would not be seen without them—the broadcast team—who make sure that we are available to conduct our proceedings in public. There has been great interest over the last few months. Since the Committee was formed, as many people have seen, we have had an extensive set of inquiries into Covid and the scientific aspects of that, as well as into commercial genomics and this very important question of 5G. It has been a very intense period, especially for the staff, so I am very grateful for their support.